PATENT ABSTRACTS OF JAPAN

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(71)Applicant : OHARA INC

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(54) OPTICAL GLASS

(57)Abstract:

PURPOSE: To obtain optical glass having optical constant comprising 1.65-1.90 refractive index and 35-65 Abbe's number and exhibiting devitrification resistance enough to mass-produce by limiting the component composition, using B2O3, La2O3, Lu2O3 and RO necessary component and specifying other components, refractive index and Abbe's number.

CONSTITUTION: This optical glass contains components comprising 1-45wt.% B2O3, 0-30wt.% SiO2 and 0-10wt.% GeO with the proviso that total amount of B2O3+SiO2+GeO2 is 10-45wt.%, 1-50wt.% La2O3, 0.5-30wt.% Lu2O3, 0-20wt.% Y2O3, 0-20wt.% Gd2O3 and 0-20wt.% Yb2O3 with the proviso that total amount of La2O3+Lu2O3+Y2O3+Gd2O3+Yb2O3 is 15-64wt.%, 1-45wt.% RO (R is Zn, Mg, Ca, Sr or Ba), 0-5wt.% Al2O3, 0-20wt.% total amount of TiO2+ZrO2, 0-40wt.% total amount of Ta2O5+Nb2O5+WO3, 0-20wt.% R'2O (R' is Li, Na or K) and 0-2wt.% Sb2O3 and having optical constant comprising 1.65-1.90 refractive index (nd) and 35-65 Abbe's number.

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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] By weight %, B-2 O3 1 - 45%, SiO2 0 - 30%, GeO2 The total quantity of 0 - 10%, however B-2O3+SiO2+GeO2 10 - 45%, La 2O3 1 - 50%, Lu 2O3 0.5 - 30%, Y2O3 0 - 20%, Gd 2O3 0 - 20%, Yb 2O3 The total quantity of 0 - 20%, however La2O3+Lu2O3+Y2O3+Gd2O3+Yb 2O3 15 - 65%, RO (however, R=Zn, Mg, calcium, Sr, Ba) 1 - 45%, aluminum2O3 0- 0 - 20% of total quantities of 5% and TiO2+ZrO2, the total quantity of Ta2O5+Nb2O5+WO3 0 - 40%, R'2O (however, R'=Li, Na, K) 0 - 10%, Sb 2O3 0- Optical glass with which each component of 2%** is contained, and a refractive index (nd) is characterized by 1.65-1.90, and the Abbe number (nud) having the optical constant of the range of 35-65.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the optical glass with which 1.65-1.90, and the Abbe number (nud) have [a refractive index (nd)] the optical constant of the range of 35-65.
[0002]
[Description of the Prior Art] The glass which used B-2s La [O3 and] 2O3 as the principal component from the former as optical glass which has said optical constant is known variously. For example, B-2O3-SiO2-La2O3-BaO-ZrO2 system, B-2O3-La2O3-Gd2O3-RO, and/or 2Oaluminum3 system (RO is a divalent metal oxide), Glass, such as B-2O3-SiO2-La2O3-Y2O3-ZrO2-Ta2O5 system and/or a B-2O3-SiO2-La2O3-Y2O3-ZrO2-ZnO system, and a B-2O3-La2O3-Y2O3-RO-Li2O system, is proposed in each official report, such as JP,51-34914,A, JP,48-61517,A, JP,52-48609,B, JP,55-116641,A, and JP,60-221338,A, respectively. Generally, since these glass is inferior to devitrification-proof nature, found in said each official report, no glass has enough importance also in the improvement of devitrification-proof nature, and development of the glass which was further excellent in devitrification-proof nature on glass shaping is desired.
[0003]
[Problem(s) to be Solved by the Invention] This invention has a refractive index (nd) in offering the optical glass in which the stability (devitrification-proof nature) over sufficient devitrification for 1.65-1.90, and the Abbe number (nud) to be able to mass-produce with the optical constant of the range of 35-65 is shown.
[0004]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, maintaining said optical constant in the B-2O3-La2O3-Lu2O3-RO system glass of the specific range, as a result of repeating test research wholeheartedly, this invention person finds out that the devitrification-proof nature which was excellent much more is shown, and came to make this invention.
[0005] The description of the optical glass concerning this invention is weight %. B-2 O3 1 - 45%, SiO2 0 - 30%, GeO2 The total quantity of 0 - 10%, however B-2O3+SiO2+GeO2 10 - 45%, La 2O3 1 - 50%, Lu 2O3 0.5 - 30%, Y2O3 0 - 20%, Gd 2O3 0 - 20%, Yb 2O3 15 - 65% of total quantities of 0 - 20%, however La2O3+Lu2O3+Y2O3+Gd2O3+Yb 2O3, RO (however, R=Zn, Mg, calcium, Sr, Ba) 1 - 45%, aluminum 2O3 0- 0 - 20% of total quantities of 5% and TiO2+ZrO2, the total quantity of Ta2O5+Nb2O5+WO3 0 - 40%, R'2O (however, R'=Li, Na, K) 0 - 10%, Sb 2O3 0- It is in containing each component of 2%**.
[0006] Especially the B-2O3-La2O3-Lu2O3-RO system glass by this invention has the description in the point constituted by B-2O3-La2O3-RO system glass based on the knowledge which is not in the conventional technique in which it is very important to make 2OLu3 component live together among various components in the above-mentioned purpose achievement.
[0007] Next, the reason which limited the presentation range of each component is explained as above-mentioned. In the optical glass of this invention, the chemical durability of glass deteriorates at the same

time homogeneous glass will no longer be obtained by volatilization of B-2O3 component if the devitrification inclination of glass increases that the amount of B-2O3 component is less than 1% and it exceeds 45% although each component of B-2s O3, SiO2, and GeO2 is a glass formation component among those. Again. If the amount of SiO2 component exceeds 30%, it will become difficult to get about glass homogeneous from soluble aggravation. Although GeO2 component can furthermore be added for optical constant adjustment, even 10% is enough as the amount. When one sort or two sorts or more of total quantities, B-2s O3 and SiO2 and GeO2 each component, are required 10% or more because of devitrification prevention of glass and the total quantity of these components exceeds 45%, it becomes impossible however, to maintain a target optical constant.

[0008] Although 2OLa3 component is a component effective in giving the aforementioned optical constant to glass, if the devitrification-proof nature improvement effect of glass according [the amount] to coexistence with Lu 2O3 is not fully acquired but exceeds 50%, at less than 1%, it will on the contrary become easy to devitrify glass.

[0009] Although it is the important component which found out that 2OLu3 component expanded the vitrification range, and showed better devitrification-proof nature by making it coexist with 2OLa3 component in the glass of this invention, if less than 0.5% of the effectiveness is not enough as the amount and the amount exceeds 30%, it will on the contrary become easy to devitrify glass.

[0010] Each component of Y2O3, Gd2O3, and Yb2O3 is a component effective in giving said optical constant to glass, and glass excellent in devitrification-proof nature is obtained by multicomponent-izing a glass presentation together with La 2O3 and Lu2O3. However, in order to acquire many above-mentioned effectiveness, it is required to make two or more sorts of total quantities of the these 5 components 15% or more. Moreover, if the amount of these components exceeds 65%, it will on the contrary become easy to devitrify glass.

[0011] Although each component of ZnO, MgO, CaO, SrO, and BaO is effective in raising the devitrification-proof nature of glass, and homogeneity, in order to acquire many above-mentioned effectiveness of these divalent metal oxide component, one sort or two sorts or more of total quantities of these components are required for it 1% or more. However, if the amount of these components exceeds 45%, the chemical durability of glass will get worse remarkably.

[0012] Although 2Oaluminum3 component can be added to arbitration for the chemical durability improvement of glass, even 5% is enough as the amount.

[0013] Although each component of TiO2 and ZrO2 can be added to arbitration for the chemical durability improvement of glass, and optical constant adjustment, if one sort or two sorts of total quantities of these components exceed 20%, it will become easy to devitrify glass.

[0014] Although each component of Ta 2O5, Nb2O5, and WO3 can be added to arbitration for the devitrification-proof nature improvement of glass, and optical constant adjustment, if one sort or two sorts or more of total quantities of these components exceed 40%, it will become easy to devitrify glass.

[0015] Although each component of Li2O, Na2O, and K2O can be added for the melting nature improvement of glass, if one sort or two sorts or more of total quantities of these components exceed 10%, chemical durability will get worse remarkably.

[0016] Although 2OSb3 component can be added to arbitration as a clarifier in the case of melting of glass, 2% or less is enough as the amount.

[0017] in addition, the glass of this invention -- components other than the above, for example, F and Bi 2O3, and HfO2 and Cs2 -- even if it adds if needed for the improvement of adjustment of an optical constant, the solubility of glass, and devitrification nature to about a total of 3% of components, such as O and SnO, it does not interfere.

[0018]

[Example] Next, it was shown in Table 1 with the refractive index (nd) of the glass obtained, respectively about the example of an operation presentation concerning the optical glass of this invention (No.1-No.10), and the example of a comparison presentation of said conventional optical glass (No.11-No.13), the Abbe number (nud), and the measurement result of a devitrification trial.

[0019] A devitrification trial is a trial for the devitrification generated at the time of glass shaping, and

80g of glass samples is paid to 50 cc pot made from platinum. After lowering the temperature after fusing each sample at the temperature of 1100-1300 degrees C for 2 hours according to the difficulty of the melting nature of each glass in an electric furnace, and keeping each sample warm for 2 hours at 1000 degrees C, 975 degrees C, and 950 degrees C, it is what took out outside the furnace and observed the existence of devitrification under the microscope. Consequently, x mark showed the glass, as for the glass with which devitrification is not accepted, devitrification was accepted to be by O mark again.

[0020]

[Table 1]

単位；重量%

	実施例				
	1	2	3	4	5
SiO_2	30.0	15.0		2.0	20.0
B_2O_3	1.0	5.0	10.0	10.0	20.0
GeO_2				10.0	
La_2O_3	1.0	10.0	10.0	40.0	28.0
Lu_2O_3	30.0	5.0	18.0	5.0	2.0
Y_2O_3					
Gd_2O_3				10.0	
Yb_2O_3					
ZnO				1.0	5.0
MgO		3.0			
CaO	10.0		4.0		5.0
SrO		7.0			3.0
BaO	10.0		41.0		5.0
Al_2O_3	1.0		5.0		0.5
TiO_2	3.6	20.0	7.0		
ZrO_2	6.5		3.0	2.5	7.5
Ta_2O_5				18.5	
Nb_2O_5	4.9	22.0		1.0	
WO_3		3.0	1.0		
Li_2O	1.0		1.0		4.0
Na_2O		5.0			
K_2O		5.0			
Sb_2O_3	1.0				
nd	1.665	1.876	1.741	1.856	1.692
νd	42.7	35.2	37.5	40.9	51.6
失透試験 1000℃	○	○	○	○	○
失透試験 975℃	○	○	○	○	○
失透試験 950℃	○	○	○	○	○

[Table 1]

単位；重量%

	実施例				
	6	7	8	9	10
SiO_2		5.0		6.0	
B_2O_3	20.0	25.0	28.0	30.0	45.0
GeO_2			5.0		
La_2O_3	17.0	50.0	20.0	23.5	29.0
Lu_2O_3	3.0	0.5	20.0	1.5	1.0
Y_2O_3	2.0		7.0	6.0	10.0
Gd_2O_3	2.0				5.0
Yb_2O_3	2.0	14.5	3.0		
ZnO				23.1	5.0
MgO					
CaO			5.0		
SrO					
BaO	6.5	1.0			
Al_2O_3	2.5				
TiO_2				0.1	
ZrO_2		3.9		6.0	2.0
Ta_2O_5					
Nb_2O_5	40.0				
WO_3			5.0		
Li_2O			5.0	3.3	3.0
Na_2O					
K_2O	5.0				
Sb_2O_3		0.1	2.0	0.5	
nd	1.899	1.779	1.729	1.708	1.691
νd	38.0	47.7	52.5	48.9	56.8
失透試験 1000℃	○	○	○	○	○
失透試験 975℃	○	○	○	○	○
失透試験 950℃	○	○	○	○	○

[Table 1]

単位；重量%

	比較例		
	11	12	13
SiO_2	2.0	20.0	
B_2O_3	10.0	20.0	45.0
GeO_2	10.0		
La_2O_3	45.0	28.0	1.0
Lu_2O_3			
Y_2O_3			10.0
Gd_2O_3	10.0	2.0	5.0
Yb_2O_3			
ZnO	1.0	5.0	5.0
MgO			
CaO		5.0	
SrO		3.0	
BaO		5.0	
Al_2O_3		0.5	
TiO_2			
ZrO_2	2.5	7.5	2.0
Ta_2O_5	18.5		
Nb_2O_5	1.0		
WO_3			
Li_2O		4.0	3.0
Na_2O			
K_2O			
Sb_2O_3			
nd	1.857	1.690	1.693
νd	40.9	51.8	56.9
失透試験 1000℃	○	○	○
失透試験 975℃	×	×	○
失透試験 950℃	×	×	×

[0021] Each glass of the example of this invention has said predetermined optical constant as it sees in Table 1. Moreover, compared with the glass of the example of a comparison of No.11-No.13 which does not contain Lu 2O3, each of these glass is excellent in devitrification-proof nature, and it is further easy to homogenize it. For this reason, the glass of said example is easy to manufacture. In addition, after the glass of the example of an operation presentation of this invention given in Table 1 all carries out weighing capacity mixing at a predetermined rate using the usual optical-glass raw materials, such as an oxide, a carbonate, and a nitrate, it is thrown into platinum crucible, after fusing for 2 to 4 hours and carrying out stirring homogenization at the temperature of 1000-1300 degrees C according to the difficulty of melting by presentation, can be lowered to suitable temperature and can be easily obtained by casting and cooling slowly to metal mold etc.

[0022]

[Effect of the Invention] Since the optical glass of this invention has the specific presentation of a B-2O3-La2O3-Lu2O3-RO system, the glass with which a refractive index (nd) has [1.65-1.90, and the Abbe number (nud)] the devitrification-proof nature which was excellent much more compared with the optical constant of the range of 35-65 and conventional glass is obtained as stated above.

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CONSTITUTION: This optical glass contains components comprising 1-45wt.% B2O3, 0-30wt.% SiO2 and 0-10wt.% GeO with the proviso that total amount of B2O3+SiO2+GeO2 is 10-45wt.%, 1-50wt.% La2O3, 0.5-30wt.% Lu2O3, 0-20wt.% Y2O3, 0-20wt.% Gd2O3 and 0-20wt.% Yb2O3 with the proviso that total amount of La2O3+Lu2O3+Y2O3+Gd2O3+Yb2O3 is 15-64wt.%, 1-45wt.% RO (R is Zn, Mg, Ca, Sr or Ba), 0-5wt.% Al2O3, 0-20wt.% total amount of TiO2+ZrO2, 0-40wt.% total amount of Ta2O5+Nb2O5+WO3, 0-20wt.% R'2O (R' is Li, Na or K) and 0-2wt.% Sb2O3 and having optical constant comprising 1.65-1.90 refractive index (nd) and 35-65 Abbe's number.

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審査請求　未請求　請求項の数１　ＦＤ　（全　６　頁）

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(54)【発明の名称】　光学ガラス

(57)【要約】

【目的】　本発明は、屈折率（ｎｄ）が１．６５～１．９０、アッベ数（νｄ）が３５～６５の範囲の光学恒数を有し、かつ、失透に対する十分なる安定性を示す光学ガラスを提供することにある。

【構成】　必須成分が重量％で、B_2O_3　１～４５％、La_2O_3　１～５０％、Lu_2O_3　０．５～３０％、ＲＯ（ただし、Ｒ＝Ｚｎ、Ｍｇ、Ｃａ、Ｓｒ、Ｂａ）　１～４５％から成る。

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【特許請求の範囲】

【請求項１】　重量％で、B_2O_3　１～４５％、SiO_2　０～３０％、GeO_2　０～１０％、ただし、$B_2O_3+SiO_2+GeO_2$の合計量　１０～４５％、La_2O_3　１～５０％、Lu_2O_3　０．５～３０％、Y_2O_3　０～２０％、Gd_2O_3　０～２０％、Yb_2O_3　０～２０％、ただし、$La_2O_3+Lu_2O_3+Y_2O_3+Gd_2O_3+Yb_2O_3$の合計量　１５～６５％、RO（ただし、R＝Zn、Mg、Ca、Sr、Ba）　１～４５％、Al_2O_3　０～　５％、TiO_2+ZrO_2の合計量　０～２０％、$Ta_2O_5+Nb_2O_5+WO_3$の合計量　０～４０％、R'_2O（ただし、R’＝Li、Na、K）　０～１０％、Sb_2O_3　０～　２％、の各成分を含有し、かつ、屈折率（nd）が１．６５～１．９０、アッベ数（νd）が３５～６５の範囲の光学恒数を有することを特徴とする光学ガラス。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、屈折率（nd）が１．６５～１．９０、アッベ数（νd）が３５～６５の範囲の光学恒数を有する光学ガラスに関する。

【０００２】

【従来の技術】従来から、前記光学恒数を有する光学ガラスとしてはB_2O_3およびLa_2O_3を主成分としたガラスが種々知られている。例えば、$B_2O_3-SiO_2-La_2O_3-BaO-ZrO_2$系、$B_2O_3-La_2O_3-Gd_2O_3-RO$および／または$Al_2O_3$系（ROは２価金属酸化物）、$B_2O_3-SiO_2-La_2O_3-Y_2O_3-ZrO_2-Ta_2O_5$系および／または$B_2O_3-SiO_2-La_2O_3-Y_2O_3-ZrO_2-ZnO$系、$B_2O_3-La_2O_3-Y_2O_3-RO-Li_2O$系等のガラスが、それぞれ特開昭５１－３４９１４号、特開昭４８－６１５１７号、特公昭５２－４８６０９号、特開昭５５－１１６６４１号および特開昭６０－２２１３３８号等の各公報において提案されている。一般的にこれらのガラスは耐失透性に劣っていることから、前記各公報に掲載のガラスはいずれも耐失透性の改善に重点がおかれているが十分ではなく、ガラス成形上さらに耐失透性に優れたガラスの開発が望まれている。

【０００３】

【発明が解決しようとする課題】本発明は、屈折率（nd）が１．６５～１．９０、アッベ数（νd）が３５～６５の範囲の光学恒数と大量生産し得るに十分な失透に対する安定性（耐失透性）を示す光学ガラスを提供することにある。

【０００４】

【課題を解決するための手段】上記目的を達成するために本発明者は、鋭意試験研究を重ねた結果、特定範囲の$B_2O_3-La_2O_3-Lu_2O_3-RO$系ガラスにおいて、

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前記光学定数を維持しつつ、一段と優れた耐失透性を示すことを見いだし、本発明をなすに至った。

【０００５】本発明にかかる光学ガラスの特徴は、重量％で、B_2O_3　１～４５％、SiO_2　０～３０％、GeO_2　０～１０％、ただし、$B_2O_3+SiO_2+GeO_2$の合計量　１０～４５％、La_2O_3　１～５０％、Lu_2O_3　０．５～３０％、Y_2O_3　０～２０％、Gd_2O_3　０～２０％、Yb_2O_3　０～２０％、ただし、$La_2O_3+Lu_2O_3+Y_2O_3+Gd_2O_3+Yb_2O_3$の合計量　１５～６５％、RO（ただし、R＝Zn、Mg、Ca、Sr、Ba）　１～４５％、Al_2O_3　０～　５％、TiO_2+ZrO_2の合計量　０～２０％、$Ta_2O_5+Nb_2O_5+WO_3$の合計量　０～４０％、R'_2O（ただし、R’＝Li、Na、K）　０～１０％、Sb_2O_3　０～　２％、の各成分を含有することにある。

【０００６】本発明による$B_2O_3-La_2O_3-Lu_2O_3-RO$系ガラスは、上記目的達成に当たり、$B_2O_3-La_2O_3-RO$系ガラスに、種々の成分中、とくに$Lu_2O_3$成分を共存させることがきわめて重要であるという従来技術にない知見にもとづいて構成されている点に特徴がある。

【０００７】次に、上記のとおり、各成分の組成範囲を限定した理由について述べる。本発明の光学ガラスにおいて、B_2O_3、SiO_2およびGeO_2の各成分は、ガラス形成成分であるが、そのうちB_2O_3成分の量が１％未満であるとガラスの失透傾向が増大し、また４５％を超えるとB_2O_3成分の揮発により均質なガラスが得られなくなると同時に、ガラスの化学的耐久性が劣化する。また。SiO_2成分の量が３０％を超えると溶解性の悪化から均質なガラスを得難くなる。さらにGeO_2成分は光学恒数調整のため添加し得るが、その量は１０％までで十分である。しかしB_2O_3、SiO_2およびGeO_2各成分の１種または２種以上の合計量はガラスの失透防止のため１０％以上必要であり、またこれらの成分の合計量が４５％を超えると目標の光学恒数を維持できなくなる。

【０００８】La_2O_3成分は、前記の光学恒数をガラスに与えるのに有効な成分であるが、その量が１％未満では、Lu_2O_3との共存によるガラスの耐失透性改善効果が十分に得られず、５０％を超えるとガラスはかえって失透しやすくなる。

【０００９】Lu_2O_3成分は、本発明のガラスにおいてLa_2O_3成分と共存させることによってガラス化範囲を拡大し、一段と良好な耐失透性を示すことを見いだした重要な成分であるが、その量が０．５％未満では、その効果が十分でなく、また、その量が３０％を超えると、ガラスはかえって失透しやすくなる。

【００１０】Y_2O_3、Gd_2O_3およびYb_2O_3の各成分

は、前記光学恒数をガラスに与えるのに有効な成分であり、La_2O_3およびLu_2O_3と合わせてガラス組成を多成分化することにより、耐失透性に優れたガラスが得られる。しかし、上記の諸効果を得るためには、これら５成分のうちの２種以上の合計量を１５％以上にすることが必要である。またこれらの成分の量が６５％を超えるとガラスはかえって失透しやすくなる。

【００１１】ＺｎＯ、ＭｇＯ、ＣａＯ、ＳｒＯおよびＢａＯの各成分は、ガラスの耐失透性や均質性を向上させる効果があるが、これら２価金属酸化物成分の上記諸効果を得るためには、これらの成分の１種または２種以上の合計量が１％以上必要である。しかし、これらの成分の量が４５％を超えるとガラスの化学的耐久性が著しく悪化する。

【００１２】Al_2O_3成分は、ガラスの化学的耐久性改善のために任意に添加し得るが、その量は５％までで十分である。

【００１３】TiO_2、ZrO_2の各成分は、ガラスの化学的耐久性改善および光学恒数調整のため任意に添加し得るが、これらの成分の１種または２種の合計量が２０％を超えるとガラスは失透しやすくなる。

【００１４】Ta_2O_5、Nb_2O_5およびWO_3の各成分は、ガラスの耐失透性改善および光学恒数調整のため任意に添加し得るが、これらの成分の１種または２種以上の合計量が４０％を超えるとガラスは失透しやすくなる。

【００１５】Li_2O、Na_2O、K_2Oの各成分はガラスの溶融性改善のために添加し得るが、これらの成分の

１種または２種以上の合計量が１０％を超えると化学的耐久性が著しく悪化する。

【００１６】Sb_2O_3成分はガラスの溶融の際の清澄剤として任意に添加し得るが、その量は２％以下で十分である。

【００１７】なお、本発明のガラスに上記以外の成分、例えばＦ、Bi_2O_3、HfO_2、Cs_2OおよびSnO等の成分の合計３％程度まで、光学恒数の調整、ガラスの溶解性および失透性の改善のため必要に応じ添加してもさしつかえない。

【００１８】

【実施例】次に、本発明の光学ガラスにかかる実施組成例（Ｎｏ．１～Ｎｏ．１０）および前記従来の光学ガラスの比較組成例（Ｎｏ．１１～Ｎｏ．１３）についてそれぞれ得られたガラスの屈折率（ｎｄ）、アッベ数（νｄ）および失透試験の測定結果とともに表１に示した。

【００１９】失透試験はガラス成形時に発生する失透を対象とした試験であり、白金製の５０ｃｃポットにガラス試料８０ｇを入れて、電気炉中で各ガラスの溶融性の難易度に応じて、各試料を１１００～１３００℃の温度で２時間溶融した後、降温して各試料を１０００℃、９７５℃および９５０℃で２時間保温した後、炉外に取り出して失透の有無を顕微鏡により観察したもので、その結果、失透が認められないガラスは○印で、また失透が認められたガラスは×印で示した。

【００２０】

【表１】

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単位；重量%

		実施例 1	2	3	4	5
SiO_2		30.0	15.0		2.0	20.0
B_2O_3		1.0	5.0	10.0	10.0	20.0
GeO_2					10.0	
La_2O_3		1.0	10.0	10.0	40.0	28.0
Lu_2O_3		30.0	5.0	18.0	5.0	2.0
Y_2O_3						
Gd_2O_3					10.0	
Yb_2O_3						
ZnO					1.0	5.0
MgO			3.0			
CaO		10.0		4.0		5.0
SrO			7.0			3.0
BaO		10.0		41.0		5.0
Al_2O_3		1.0		5.0		0.5
TiO_2		3.6	20.0	7.0		
ZrO_2		6.5		3.0	2.5	7.5
Ta_2O_5					18.5	
Nb_2O_5		4.9	22.0		1.0	
WO_3			3.0	1.0		
Li_2O		1.0		1.0		4.0
Na_2O			5.0			
K_2O			5.0			
Sb_2O_3		1.0				
nd		1.665	1.876	1.741	1.856	1.692
νd		42.7	35.2	37.5	40.9	51.6
失透試験	1000℃	○	○	○	○	○
	975℃	○	○	○	○	○
	950℃	○	○	○	○	○

【表１】

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単位；重量%

		実施例				
		6	7	8	9	10
SiO_2			5.0		6.0	
B_2O_3		20.0	25.0	28.0	30.0	45.0
GeO_2				5.0		
La_2O_3		17.0	50.0	20.0	23.5	29.0
Lu_2O_3		3.0	0.5	20.0	1.5	1.0
Y_2O_3		2.0		7.0	6.0	10.0
Gd_2O_3		2.0				5.0
Yb_2O_3		2.0	14.5	3.0		
ZnO					23.1	5.0
MgO						
CaO				5.0		
SrO						
BaO		6.5	1.0			
Al_2O_3		2.5				
TiO_2					0.1	
ZrO_2			3.9		6.0	2.0
Ta_2O_5						
Nb_2O_5		40.0				
WO_3				5.0		
Li_2O				5.0	3.3	3.0
Na_2O						
K_2O		5.0				
Sb_2O_3			0.1	2.0	0.5	
nd		1.899	1.779	1.729	1.708	1.691
νd		38.0	47.7	52.5	48.9	56.8
失透試験	1000℃	○	○	○	○	○
	975℃	○	○	○	○	○
	950℃	○	○	○	○	○

【表１】

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単位：重量%

		比較例		
		11	12	13
SiO_2		2.0	20.0	
B_2O_3		10.0	20.0	45.0
GeO_2		10.0		
La_2O_3		45.0	28.0	1.0
Lu_2O_3				
Y_2O_3				10.0
Gd_2O_3		10.0	2.0	5.0
Yb_2O_3				
ZnO		1.0	5.0	5.0
MgO				
CaO			5.0	
SrO			3.0	
BaO			5.0	
Al_2O_3			0.5	
TiO_2				
ZrO_2		2.5	7.5	2.0
Ta_2O_5		18.5		
Nb_2O_5		1.0		
WO_3				
Li_2O			4.0	3.0
Na_2O				
K_2O				
Sb_2O_3				
nd		1.857	1.690	1.693
νd		40.9	51.8	56.9
失透試験	1000℃	○	○	○
	975℃	×	×	○
	950℃	×	×	×

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【００２１】表１に見られるとおり、本発明の実施例のガラスはいずれも前記所定の光学恒数を有している。また、Lu_2O_3を含有しない、Ｎｏ．１１～Ｎｏ．１３の比較例のガラスに比べ、これらのガラスはいずれも耐失透性に優れ、さらに均質化しやすい。このため前記実施例のガラスは製造が容易である。なお、本発明の表１記載の実施組成例のガラスは、いずれも酸化物、炭酸塩および硝酸塩等の通常の光学ガラス原料を用いて所定の割合で秤量混合した後白金坩堝に投入し、組成による溶融の難易度に応じて１０００～１３００℃の温度で２～４時間溶融し、撹拌均質化した後適当な温度に下げて金型等に鋳込み徐冷することにより容易に得ることができる。

【００２２】

【発明の効果】以上述べたとおり、本発明の光学ガラスはB_2O_3－La_2O_3－Lu_2O_3－ＲＯ系の特定組成を有するものであるから、屈折率（ｎｄ）が１．６５～１．９０、アッベ数（νｄ）が３５～６５の範囲の光学定数と従来のガラスに比べて一段と優れた耐失透性を有するガラスが得られる。